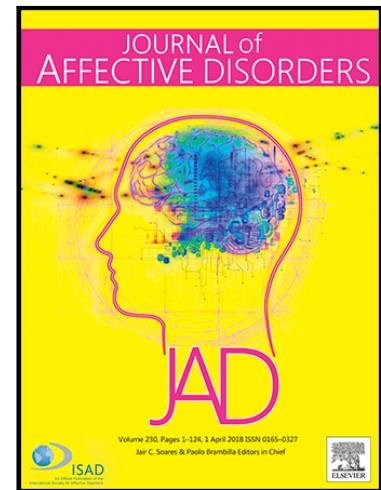


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Evaluation of a guided internet-based self-help intervention for older adults after spousal bereavement or separation/divorce: A randomised controlled trial

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Highlights

- The guided internet intervention was efficacious compared to a wait-list group.
- It improved grief, depression, psychopathology, embitterment, and loneliness.
- Widowed and divorced participants benefitted both from the intervention.
- It was also efficacious for participants with milder grief symptoms at baseline.
- Gains were maintained over three months.

Running head: LIVIA

Evaluation of a guided internet-based self-help intervention for older adults after spousal bereavement or separation/divorce: A randomised controlled trial

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Abstract

Background: While several internet interventions target severe prolonged grief symptoms after bereavement, no randomised controlled trial investigated interventions for prolonged grief after separation/divorce.

Methods: This randomised controlled trial aimed to evaluate the efficacy of a guided internet-based self-help intervention for prolonged grief symptoms after spousal bereavement or separation/divorce compared to a wait-list control group. Furthermore, we analysed whether the intervention was also efficacious for participants with milder grief symptoms.

Results: A total of 110 participants were mainly recruited by newspaper articles. Average age was 51 years, 77% were separated/divorced, 79% were female. Dropout rate was 11%. Compared to the control group, the intervention resulted in significant reductions in grief ($d = 0.81$), depression ($d = 0.59$), psychopathological distress ($d = 0.39$) (primary outcomes), embitterment ($d = 0.37$), loneliness ($d = 0.37$) and an increase in life satisfaction ($d = -0.41$) (secondary outcomes). These gains were maintained over three months. Improvements were similar among widowed and separated/divorced participants as well as among participants with low, medium or high levels of grief at baseline.

Limitations: Limitations include the self-selective sample and a rather small number of widowed participants.

Conclusions: Findings indicate that an internet intervention based on models for coping with grief after bereavement was not only beneficial for widowed but also separated or divorced participants. Furthermore, also participants with lower levels of grief at baseline benefitted from the intervention. This corroborates that indicated prevention efforts for grief are efficacious.

Keywords: internet intervention; grief; bereavement; divorce; randomised controlled trial; depression

Trial registration: Retrospectively registered at ClinicalTrials.gov (NCT02900534, September 1, 2016). The study protocol was published in *Trials*: Brodbeck, J., Berger, T., & Znoj, H. J. (2017). An internet-based self-help intervention for older adults after marital bereavement, separation or divorce: study protocol for a randomized controlled trial. *Trials*, 18(1). <https://doi.org/21.10.1186/s13063-016-1759-5>

Introduction

Grief and psychological distress are normative reactions after the loss of a partner and most individuals adapt after a certain time. However, some individuals experience prolonged grief symptoms or develop even a Persistent Complex Bereavement Disorder (Aoun et al., 2015; Kersting et al., 2011; Shear et al. 2013), which is characterised by persistent separation distress, frequent or disabling cognitive, emotional and behavioural symptoms such as avoidance of reminders of the loved one, difficulties moving on with life and functional impairment (e.g. Prigerson et al., 2009).

Several models identify characteristics of a positive adaptation after bereavement. The task model of mourning for example posits that accepting the reality of the loss, experiencing the pain of grief, adjusting to an environment without the deceased person, and withdrawing emotional energy and reinvesting it in another relationship are crucial for a positive adaptation after a loss (Worden, 2009). The dual-process model of coping with bereavement underlines the importance of oscillating between loss-oriented tasks such as grief work and expressing emotions towards the deceased and restoration-oriented tasks such as engaging in new activities, distracting from grief, and finding new roles and identities (Stroebe & Schut, 1999).

Most research has focused on severe prolonged grief after bereavement, but not on grief after a separation or divorce. As the number of divorces among adults over 50 year has considerably increased during the last decades (Brown & Lin, 2012), grief after a separation or divorce is an understudied, but very relevant issue. Both, spousal bereavement and separation/divorce share common characteristics. Both events require a

dissolution of social and emotional ties, the reorganisation of daily routine and the formation of a new identity and a new perspective for the future (Znoj, 2016).

While, to the best of our knowledge, no previous randomised controlled trial has focused on treating prolonged grief symptoms after a divorce, there is broad evidence that interventions for prolonged severe grief after bereavement were efficacious (Currier et al. 2008; Wittouck et al. 2011). Interventions after the loss of a spouse, a child or another significant person generally include the exposure to the experience of the loss, cognitive reappraisal of the loss, and integration and restoration of the experience of the loss into daily life (Shear et al., 2005; Boelen et al., 2007). Recently, efficacious internet-based interventions have complemented face-to-face grief counselling or therapy (Eisma et al., 2015; Litz et al., 2014; van der Houwen et al., 2010; Wagner et al., 2006). Effect sizes in guided internet-based interventions were in the moderate to large range. Advantages of internet interventions are the flexible usage independent of time and place, usage at a self-determined pace, a high level of autonomy and privacy, and lower costs (Schröder et al., 2016).

Conflicting results exist regarding trials for preventing complicated grief after bereavement. Meta-analyses found no effects for preventive interventions (Currier et al., 2008; Neimeyer 2000; Wittouck et al., 2011). Currier et al. (2008) differentiated between universal, selective and indicated intervention and found that indicated preventive interventions for individuals who manifest difficulties with coping with bereavement benefitted for preventive interventions. A controlled trial on an indicated preventive internet intervention for prolonged grief disorders (Litz et al., 2014) corroborated these results. The intervention focused on self-care, social reengagement and goal-focused activities without components of exposure or cognitive reappraisal and found moderate to large effect sizes.

Objectives

In a randomised controlled trial, we aimed to evaluate the acceptability and efficacy of a guided internet-based self-help intervention for prolonged grief symptoms after spousal bereavement and separation/divorce in comparison to a wait-list control group. We expected that the intervention called LIVIA would have beneficial effects on grief, depression symptoms and psychological distress (primary outcomes), as well as on embitterment, loneliness, and satisfaction with life (secondary outcomes). We expected the effects to be stable in the three-month follow-up.

Secondly, we assumed that the intervention, which was based on models for treating prolonged severe grief after bereavement, would be efficacious for widowed as well as for separated/divorced participants. Considering similar adaptation tasks after spousal bereavement and separation/divorce, such as the dissolution of emotional ties, the formation of a new identity and a new perspective for the future, we expected that similar therapeutic techniques would be efficacious. In addition, LIVIA had a strong focus on resource activating interventions and strategies for finding comfort and self-care. We assumed that these techniques would also be suitable for treating grief after a separation/divorce.

Thirdly, we hypothesised that LIVIA would not only be efficacious for participants with severe grief, but also for participants with mild grief symptoms at baseline who seek help for coping with grief, with psychological distress or the psychosocial adaptation to the loss. This would corroborate previous studies which showed the efficacy of indicated prevention, i.e. interventions for individuals who manifest problems adapting to the loss of a spouse, but do not meet predefined criteria for psychological disorders (Currier et al., 2008).

Methods

Participants

The 110 participants were recruited between June 2016 and July 2017, mostly by newspaper articles and internet-self-help forums. All interested individuals registered on the study website, received the study information and were required to complete the baseline screening questionnaires and a telephone interview for assessing the severity of grief symptoms and the eligibility prior to randomisation. Participants gave informed consent first electronically and then orally in the telephone interview.

Eligibility criteria

Inclusion criteria were the following:

1. Experience of spousal bereavement or a separation/divorce more than six months prior to enrolling in the study.
2. Seeking help for coping with prolonged grief symptoms, psychological distress or the psychosocial adaptation to a life without the partner.
3. Having internet access.
4. Mastery of the German language.
5. An informed consent by the participant.

Exclusion criteria were the following:

1. Severe psychological or somatic disorders which needed immediate treatment and acute suicidality (BDI suicide item > 1 or suicidal ideation in the telephone interview).

2. No emergency plan: In the telephone interview, an emergency plan was developed which specified a health care professional, to whom participants could have turned to in an acute crisis. If no such person or health care service was found, individuals were excluded from the intervention.
3. Concomitant psychotherapy, and /or prescribed drugs against depression or anxiety if prescription or dosage has changed in the month prior or during the self-help intervention.
4. Inability to follow the procedures of the study, e.g. due to comprehension problems.

The email-supporters (see below) allocated eligible individuals 1:1 to the wait-list control and the intervention group. Participants in the wait-list control condition received access to the intervention 12 weeks after the baseline interview. Randomisation was performed using the True Random Number Generator on Random.org run by the Randomness and Integrity Services Ltd in Dublin (Haahr, 1998). The allocation list was concealed from the investigators and participants. Figure 1 displays the study flowchart.

Measures

Primary outcome measures included the 16-item Texas Revised Inventory of Grief – German Version (TRIG-D, Znoj, 2008) to assess the severity of grief symptoms. Answer categories were 1 = completely true to 5 = completely false. Cronbach alpha was between .82 at pre and .89 at post measurement. The TRIG showed good reliability in different samples (Montano et al., 2016) and consists of items which are applicable for different sources of grief including separation or divorce. The factorial validity was established and found to be temporally invariant over 2 - 12 months post-loss (Futterman et al., 2010).

Depression symptoms were assessed with the German version of the Beck Depression Inventory II (BDI-II, Kühner et al., 2007), a 21-item measure on a scale from 0 to 3 (Cronbach alpha .87-.90). General psychopathological distress was assessed with the German version of the Brief Symptom Inventory (BSI). The 53 items measured a broad range of somatic and psychopathological symptoms within seven days prior to completing the questionnaire (Franke, 2000). Answer categories range from 0 = not at all to 4 = very much (Cronbach alpha .96).

Secondary outcome measures included the short version of the Embitterment Scale (Znoj & Schnyder, 2014). The six items measured embitterment from 0 = I don't agree to 4 = I agree (Cronbach alpha .78 -.84). Furthermore, loneliness was assessed with the De Jong Gierveld Short Scale for Emotional and Social Loneliness (De Jong Gierveld & Van Tilburg, 2010), a six-item scale with answer categories from 0 = no to 5 = yes (Cronbach alpha .76 - .79). Life satisfaction was assessed with the German version of the Satisfaction with Life Scale (Diener et al., 1985; Schumacher, 2003). It consists of five items with answer categories from 1 = completely disagree to 7 = completely agree (Cronbach alpha .76 - .86).

Eleven items assessed the satisfaction with the intervention, e.g. "How satisfied were you with the support you received with the programme?". Response categories range from 1 = not at all to 4 = very much.

All self-report questionnaires were completed online using Qualtrics (Qualtrics, n.d.).

Baseline measurement was at t0, post measurement t1 was at week 12 after the start of the intervention/the waiting condition, post measurement/follow-up t2 was at week 24 after the start of the intervention (see Figure 1).

Trained email-supporters assessed the criteria of the DSM-5 diagnosis of a Persistent Complex Bereavement Disorder (American Psychiatric Association, 2013) in the telephone interview. In order to apply these criteria to our study, we assessed the persistence of the symptoms already six months after the loss instead of 12 months and employed the interview to individuals who lost their spouse through separation/divorce.

Intervention

The guided internet-based self-help “LIVIA” addressed older adults who experienced spousal bereavement or a separation/divorce and sought help for coping with prolonged grief symptoms, psychological distress or adaptation problems in daily life. Participants were encouraged to work through one session a week. The intervention was based on the task model of mourning (Worden, 2009) and the dual-process model of coping with bereavement (Stroebe & Schut, 1999). The cognitive-behavioural internet intervention consisted of ten text-based sessions, and included a) information about interpersonal loss and an assessment of the current personal situation; b) exposure and loss-oriented interventions for accepting memories and pain and addressing unfinished business; c) resources and restoration-oriented interventions for fostering positive emotions, self-care, positive social relationships and creating a new life without the partner. The intervention was similar for widowed and separated/divorced participants apart from adaptations regarding psychoeducation, accepting memories and telling the story of the loss. Table 1 presents details of the intervention (see also Brodbeck et al., 2017).

Insert Table 1

Participants received weekly e-mail support from one of five female Master of Science students who were in their last term of a graduate programme in clinical psychology at the Department of Clinical Psychology and Psychotherapy of the University of Berne, Switzerland. A fully

trained psychotherapist supervised the e-mail-supporters. In short half-standardised emails, the supporters a) acknowledged the participants for their work with the intervention; b) motivated them to continue their work, and c) answered questions regarding the intervention or provided help in the case of technical problems. Additionally, participants could contact the supporters via a contact button in the programme.

Statistical analyses

Analyses were conducted according to the intention-to-treat paradigm. We conducted multilevel mixed-effects models with repeated measures data in SPSS to evaluate the efficacy of the intervention and the stability of the effects. We used restricted maximum likelihood (REML) estimation, which is recommended for small group samples and yields asymptotically efficient estimators for balanced and unbalanced designs (Heck et al., 2010). Mixed-effects model have several advantages. They take into account the dependency of the data and account for the correlation of the repeated measures within individuals. Furthermore, mixed-effects models use all available data of each participant and estimates parameter of missing values (Bell & Fairclough, 2013, Gueorgieva & Krystal, 2004). We computed single models for each outcome variable. Only models with a first order autoregressive covariance structure converged and provided the best model fit based on the Bayesian Information Criteria (BIC).

The pre – post comparisons of all outcome measures included time as a within-group variable, the condition as a between-group variable and an interaction term time by group for cross-level interactions. To analyse the effects of the baseline levels of grief, we computed tertiles for creating groups with low, moderate and high levels of grief. To test whether the intervention was also efficacious for separated/divorced participants and those with a low level of grief, we used within-group pre-post effect sizes. Group sizes were too small for including cross-level three-way interaction terms in the mixed-effects models to test moderation effects. We calculated a Reliable Change Index (RCI, Jacobson & Truax, 1991) as

measure of clinical change. To test the stability of the effects from post-treatment to follow-up, we included only time as within-group factor in the mixed-effects models. Only participants who completed the post-measure were included in the stability analyses. We used t-tests for independent samples for analysing differences between widowed and separated/divorced participants and between dropout and completers. We used χ^2 -tests for comparing the number of participants who showed reliable change in the intervention and the wait-list control group.

As within- and between-group effect sizes, we calculated Cohens d based on the estimated means and the observed pooled standard deviations. We computed effect sizes sensu Morris (2008) for the pre-post comparison for the intervention group and the wait-list group controlling for the baseline measures.

A power analyses specified the sample size needed based on a probability level of .05 and a power of 0.80 using a single level repeated measures ANOVA with G*Power (Faul et al., 2009). We assumed a large effect found in previous studies (Eisma et al., 2015; Litz et al., 2014; Wagner et al., 2006) for the comparison of the intervention group and the wait-list control group. The minimum sample size for between factors pre-post comparisons was 40 individuals. Expecting a dropout rate of 40%, we aimed at recruiting at least 56 participants.

Results

Baseline characteristics

Table 2 presents the baseline characteristics of the participants. The sample consisted of 110 German-speaking adults among whom 23% were widowed and 77% were separated or divorced. Mean age was 51 years, 72% of the participants were female. The majority were of Swiss origin (73%) and went to a vocational school (37%) or university (34%). The average time since the event was two years ($M = 2.20$, $SD = 2.90$). About a

quarter of the participants (24.5%) reached the B, C, and D criteria of a Persistent Complex Bereavement Disorder in the DSM-5. The participants reported higher levels of grief symptoms than the validation sample of the TRIG-D, which included parents who lost a child (Znoj, 2008). The average total psychopathology score in the BSI was 47.74 ($SD = 30.20$). The average total depression score indicated by the BDI-II was 20.50 ($SD = 10.32$); 30.90% of the participants reported a mild depression, 27.3% a moderate and 15.5% a severe depression.

Table 3 compares widowed and separated/divorced participants at baseline. Compared to widowed participants, participants in the separated/divorced group were significantly younger (48 vs. 63 years) and reported a shorter duration of the relationship (14 vs. 29 years). Significantly more separated/divorced participants reached the B, C, and D criteria of a Persistent Complex Bereavement Disorder in the DSM-5. Regarding the primary outcome variables, widowed and separated/divorced participants reported a similar level of grief, as well as depressive and psychopathological distress at baseline. For the secondary outcome variables, separated/divorced participants reported significantly more embitterment and lower life satisfaction as well as a trend towards more loneliness.

Insert table 2 and 3

Adherence to treatment and dropout analysis

Participants of the intervention group completed on average eight of the ten modules ($M = 8.05$, $SD = 2.86$), 57.4% completed all modules. Two individuals did not start the self-help intervention (3.3%). Widowed and separated/divorced participants did not differ in terms of adherence ($M_B = 8.50$ $SD_B = 3.00$, vs. $M_D = 7.94$, $SD_D = 2.85$, $t(59) = -0.61$, $p = .548$, $d = .19$).

Of the 110 randomised individuals, 98 (89.1%) completed the post measurement, whereas 12 individuals (11%) did not fill out the post measurement (see Figure 1). Completers and individuals who did not fill out the post questionnaires did not significantly differ in terms of baseline characteristics such demographics or level of distress ($p > .101$). However, participants who did not fill out the post-questionnaires were more often in the intervention group (16.4% vs. 4.1%, $\chi^2(1) = 4.24$, $p = .040$, $\phi = .20$) and completed significantly fewer sessions than completers ($M_{Do} = 3.60$, $SD_{Do} = 4.03$ vs $M_C = 8.61$, $SD_C = 2.09$, $t(59) = 5.82$, $p < .0001$, $d = 2.12$). Among those who started at least one session (59 of 61 individuals in the intervention group), dropout was 13.6%.

At follow-up, 49 of 61 participants in the intervention group completed the questionnaires (80.3%). Dropout at follow-up was associated with younger age ($M_{Do} = 42.50$, $SD_{Do} = 13.47$ vs. $M_C = 52.50$, $SD_C = 12.71$, $t(59) = 2.33$, $p = .023$, $d = 0.78$), lower life satisfaction at baseline ($M_{Do} = 4.53$, $SD_{Do} = 1.12$ vs. $M_C = 3.78$, $SD_C = 1.04$, $t(57) = 2.09$, $p = .041$, $d = -0.71$), more severe grief symptoms at post measurement ($M_{Do} = 3.50$, $SD_{Do} = 0.71$ vs. $M_C = 2.71$, $SD_C = 0.84$, $t(49) = -2.02$, $p = .049$, $d = -0.97$) and fewer completed sessions ($M_{Do} = 4.08$, $SD_{Do} = 3.87$ vs. $M_C = 8.69$, $SD_C = 2.06$, $t(59) = 5.72$, $p < .0001$, $d = 1.87$). These relationships suggest a missing at random (MAR) mechanism, which is a requirement for using mixed-effects models to deal with missing data (Bell & Fairclough, 2014).

Overall effects at post-treatment

Table 4 presents the results of the mixed-effects model analyses, the observed and estimated means and standard deviations for all outcome variables. The models revealed significant group by time interactions for the primary and secondary outcome measures (b between $-.22$ for general psychopathological distress and $-.59$ for grief symptoms, $p < .025$). Thus, LIVIA resulted in significant reductions in grief, depression symptoms,

psychopathological distress, embitterment loneliness and an increase in life satisfaction compared to the wait-list group. Between group effect sizes controlling for pre-measurement sensu Morris (2008) were large for grief ($d = .81$), moderate for depression symptoms ($d = 0.59$) and small for the other outcomes (d between .37 and .41).

The reliable change index indicated that at post measurement, 27.9% of the intervention group achieved reliable change on grief symptoms, 32.8% on depression symptoms, 45.9% on general psychopathological distress (primary outcomes) and 9.8% improved embitterment, 21.3% loneliness, and 1.6% life satisfaction (secondary outcomes). In the wait-list control group, 12.2% improved grief symptoms, 10.2% depression symptoms, 16.3% general psychopathological distress, 4.1% embitterment, 8.2% loneliness, and 0.0% life satisfaction. Significantly more participants in the intervention group compared to the wait-list control group achieved reliable improvements for all outcome variables ($\chi^2 > 4.92$, $p < .027$) except embitterment and life satisfaction.

Regarding negative effects, RCI showed that in the intervention group, 9.8% deteriorated on general psychopathological distress, 1.6% increased embitterment and 1.6% decreased life satisfaction. In the control group, 4.1% deteriorated on grief, 2.0% on depression or general psychopathological distress, 4.1% on embitterment, 2.0% on loneliness, and 16.3% on life satisfaction. As the number of participants with negative effects was small, we compared participants with any negative effect in any outcome in the intervention group ($n = 8$, 14.8%) and in the wait-list control group ($n = 13$, 27.7%). There was no significant difference between the two groups ($Z = 2.52$, $p = .113$, $\phi = .16$).

Insert Table 4

Treatment satisfaction

Overall, participants reported a high level of satisfaction with the intervention ($M = 3.35$, $SD = 0.52$), lying between “satisfied” and “very satisfied”. There was no significant difference between widowed and separated/divorced participants ($M_B = 3.36$, $SD_B = 0.32$ vs. $M_D = 3.35$, $SD_D = 0.56$, $t(48) = -0.07$, $p = .948$).

Stability of the effects

Table 4 presents the post-follow-up effect sizes and the observed means and standard deviations of all outcome measures for the treatment group three months after the post measurement. There were no significant post-treatment to follow-up changes for any measure (grief: $b = -.10$, $t(45.08) = -1.39$, $p = .170$ CI $[-.25, .05]$; depression symptoms: $b = -.07$ $t(45.96) = -1.82$, $p = .076$ CI $[-.16, .01]$; general psychopathological distress: $b = .02$ $t(45.35) = 0.44$, $p = .665$ CI $[-.09, .14]$; embitterment: $b = -.01$ $t(45.48) = -0.10$, $p = .919$ CI $[-.21, .19]$; loneliness: $b = -.01$ $t(46.13) = 0.12$, $p = .906$ CI $[-.23, .20]$; life satisfaction: $b = .13$ $t(45.71) = 0.96$, $p = .343$ CI $[-.14, .40]$).

Efficacy for widowed and separated/divorce participants

Table 5 presents the means and standard deviations at pre, post and follow-up measurement, and the pre-post effect sizes for widowed and separated/divorced participants. Separated/divorced participants showed large effect sizes for an improvement in grief ($d = 0.94$) and depression symptoms ($d = 0.83$), moderate effect sizes for general psychopathology ($d = 0.66$) and loneliness ($d = 0.63$) and a small effect for embitterment ($d = 0.45$). Widowed participants showed a large effect for depression symptoms ($d = 0.80$), moderate effect sizes for grief ($d = 0.62$), loneliness ($d = 0.67$), and embitterment ($d = 0.56$), as well as a small effect for general psychopathological distress ($d = 0.43$). Life satisfaction did not improve among widowed participants. Average effect sizes were 0.61 for separated/divorced and 0.49 for widowed participants.

*Insert Table 5**Efficacy for participants with low, medium and high levels of grief at baseline*

LIVIA had similar effects at low, medium and high levels of grief at baseline. Almost all within-group pre-post effect sizes apart from life satisfaction were in moderate to large range. Grief and depression showed the strongest effects. Average effect sizes were 0.73 for the low grief group, 0.76 for the medium grief group and 0.67 for the high grief group.

Discussion

This is the first randomised controlled trial for prolonged grief symptoms that not only included participants after spousal bereavement, but also after separation or divorce. It established the efficacy of a guided internet-based self-help intervention called LIVIA for prolonged grief symptoms for widowed as well as separated/divorced participants compared to a wait-list control group. Thus, it extends existing knowledge by showing that LIVIA, which was developed based on models for coping with grief after bereavement, was efficacious for participants after separation/divorce. Furthermore, while most previous internet interventions included only participants with severe grief prolonged symptoms, LIVIA was also efficacious for help-seeking individuals with milder prolonged symptoms.

Inclusion criteria encompassed that the loss had to be more than six months before enrolling in the study and that participants were not in a concurrent psychotherapy. In contrast to other studies, we did not include a severity criterion for grief. Nevertheless, at baseline participants were considerably distressed and reported higher levels of grief symptoms than the validation sample of the TRIG-D, which included parents who lost a child (Znoj, 2008). A quarter of the participants reached the B, C, and D criteria of a Persistent Complex Bereavement Disorder of the DSM-5. An

at least mild depression reported 73% of the participants (Beck et al., 1996). However, psychopathological distress was lower than in treatment seeking Swiss outpatients (Brodbeck et al., 2014).

Efficacy compared to the wait-list control group

Participants reported high levels of satisfaction with the self-help intervention. Furthermore, dropout among those who started the first session was relatively low with 14%. This is higher than in Wagner et al. (2006) with 8% and similar to Kersting et al. (2013) with 14%. Other internet interventions on prolonged grief symptoms found higher dropout rates (17% in Litz et al., 2014; 24% in Kersting et al., 2011; 46% in Eisma et al., 2015; and 59% in Van der Houwen et al., 2010). The high level of satisfaction with the intervention, the low dropout rate and a completion rate of 57.4% for all sessions indicated that the self-help intervention is feasible and well accepted for widowed and separated/divorced participants.

LIVIA significantly decreased a broad range of outcomes, i.e. grief, depression symptoms and psychological distress (primary outcomes), as well as embitterment, loneliness, and improved satisfaction with life compared to the wait-list control group. Participants maintained these gains over three months after completing the intervention. The largest effects were found for grief and depression symptoms. In contrast, life satisfaction and embitterment were more difficult to improve. This may reflect the fact that LIVIA consisted mainly of components, which were supposed to improve grief and depression, i.e. exposure and loss-oriented interventions for accepting memories and pain and addressing unfinished business, as well as resources and restoration-oriented interventions for fostering positive emotions, self-care, positive social relationships and creating a new life without the partner. Additional components may be needed to improve embitterment. Embittered individuals often perceive their state as caused

by others or by a higher hostile force. Cognitive-behavioural interventions could target this persistent focus on injustice by reframing techniques, changing the perspective or using “wisdom strategies” (Linden et al., 2011).

In this study, the between group effect sizes for grief ($d = 0.81$) and depression ($d = 0.56$) were lower than those in Wagner et al., (2006) ($d = 1.07$ for grief, 0.82 for depression, $N = 51$) and Litz et al., (2014) ($d = 1.10$ for grief, 0.71 for depression, $N = 84$) but higher than those in van der Houwen et al., (2010) ($d = 0.25$ for grief and 0.15 for depression, $N = 757$). Small inconsistent differences were found compared to Kersting et al. (2011) ($d = 0.69$ for grief, $d = 0.53$ for depression, $N = 78$) and Kersting et al., (2013) ($d = 0.56$ for grief, 0.63 for depression, $N = 228$). When computing separate analyses for the low, moderate and high grief groups, the within-group effect sizes were considerably larger due to smaller standard deviations in the three groups than those for the whole sample. Within-group effect sizes were then in the same range as in Wagner et al., (2006) and Litz et al., (2014) who had more restrictive inclusion criteria in terms of severity of grief symptoms.

Comparison of widowed and separated/divorced participants

At baseline, widowed and separated/divorced participants reported similar levels of grief, depression and psychopathological distress. In spite of the lack of theoretical models and interventions, grief among separated/divorced participants is thus a similarly prevalent emotion as among widowed participants. Furthermore, divorced participants reported significantly higher embitterment, lower life satisfaction and a trend towards more loneliness than widowed participants did. This broader range of negative emotions among separated/divorces compared to widowed participants may reflect the more diverse circumstances of a divorce, a more difficult relationship before the separation and ongoing conflicts with

the ex-partner. Even though many individuals may cope well with their separation or divorce, the high levels of distress among help-seeking separated/divorced participants and the high response rates illustrate the need to offer interventions for this group.

Even though the sample size was not large enough for a formal moderation test with a three-way interaction term for treatment*time*event, effect sizes indicate that LIVIA was efficacious for separated/divorced participants (average within-group $d = 0.61$). This is interesting as the theoretical background of LIVIA included models for coping with grief after bereavement and techniques which were used in traditional bereavement interventions. Effect sizes in the group of widowed participants were moderate to large for depression, grief, embitterment and loneliness (average within-group $d = 0.49$). However confidence intervals for these effect sizes included 0, indicating that it cannot be ruled out that the effect size in the population is not different from 0. The wide confidence intervals in this group and thus the lower precision of the estimate may reflect the low sample size of widowed participants in the intervention group. Therefore, these results have to be confirmed in other studies with larger samples.

Efficacy for milder grief symptoms

In line with Currier et al. (2008) and Litz et al. (2014), LIVIA was efficacious for participants with lower grief levels at baseline, suggesting that LIVIA may work as indicated prevention for reducing prolonged grief and depression. This stands in contrast to meta-analyses that concluded that preventive interventions after bereavement are generally not efficacious (Neimeyer, 2000; Wittouck et al., 2011). These divergent results highlight the need to differentiate between universal, selective and indicated prevention in the context of bereavement and divorce. Importantly, we recruited individuals who sought help for coping with the loss of a partner independent of their level of grief. Help-seeking as criterion may be more

relevant for the efficacy of a grief intervention than the severity of symptoms which is normally used to distinguish prevention from treatment. One inclusion criteria was, that the loss was six months prior to enrolling to the study. Further research on the prevention of grief should explore the efficacy of preventive intervention offered earlier in the mourning process. Furthermore, dismantling studies should investigate whether confrontation and exposure to the experience of the loss are also necessary a) for indicated prevention or only for the treatment of severe prolonged grief symptoms and b) for separated/divorced or only for widowed older adults. The analysis of moderator variables may aid future selective indication and adaptations for different needs.

Limitations

Several limitations of this study have to be considered. The sample consisted of self-selected individuals who were interested in taking part in an internet-based intervention. The number of widowed participants in the intervention group was rather small. Older widow(er)s who take part in an internet intervention might be a selective group of older adults who are more flexible and interested in new developments. Other widowed older adults might prefer or benefit more from a face-to-face intervention. Furthermore, the randomisation was not performed blockwise and was not stratified by the event spousal bereavement vs. separation/divorce. As the sample size was lower than the recommended size of 200 individuals, the simple randomisation procedure resulted in different sample sizes for the intervention and the wait-list control group. However, we found no significant differences between the two groups at baseline. Another limitation is that we measured outcomes only with self-report questionnaires and did not assess a clinical diagnosis of a Persistent Complex Bereavement Disorder at post measurement. Furthermore, we were only able to

examine the stability of the improvements in the intervention group as the wait-list control group received access to the intervention after the 12-week waiting period.

Despite these limitations, the present study shows that the internet-based self-help intervention was beneficial for widowed as well as separated/divorced individuals. Furthermore, the efficacy for individuals with a lower grief level at baseline suggests that more preventive efforts can be undertaken for help-seeking older adults who do not present severe grief symptoms.

Declarations

Ethical Approval and Consent to participate

Ethical approval has been obtained by the Cantonal Ethics committee Berne (BASEC2016-00180). We have obtained informed consent from all participants in the study.

Contributors

JB, TB, and HJZ designed the study and developed the intervention. TB and HJZ supervised the whole study. TB programmed the intervention. JB and NB implemented the intervention and supervised the email supporters. NB was responsible for data collection and contributed to the analyses. JB performed the analyses. FR contributed to the analyses. All authors discussed the results. JB wrote the manuscript with input from all co-authors.

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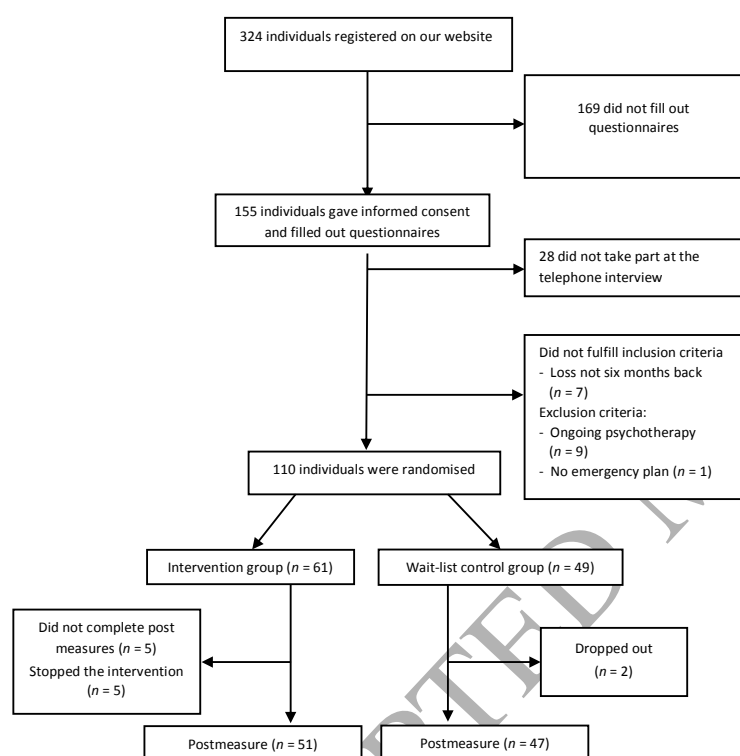


Figure 1: LIVIA flow chart study design

Table 1

Content of the ten self-help sessions

1. Psychoeducation	Information about the self-help intervention, grief reactions, emotional reactions after separation or divorce and the treatment of grief.
2. Assessment of current situation	Assessment of emotional reactions after the interpersonal loss, changes in life since and obstacles for a positive adaptation.
3. Fostering positive thoughts and emotions	Information about emotion regulation and cognitive-behavioural strategies for promoting positive thoughts and emotions. Protocols for practising these strategies in daily life.
4. Finding comfort	Suggestions for self-soothing strategies and assignments to promote positive feelings (e.g. diary for positive experiences).
5. Self-care	Assessment of the current physical, emotional and practical self-care, of self-care goals and suggestions for fostering self-care in daily life.
6. Accepting memories	Writing up the story of the loss to integrate painful memories

and pain	into the autobiographical memory
7. Unfinished business	Writing tasks to identify unfinished business and to find ways how to put issues at rest.
8. Creating a new life without the partner	Identification of changes in daily routine since the loss and sources of support and strengths before and after the loss. Identifying and activating resources in daily life. Information about posttraumatic growth.
9. Social relationships	Assessment of current relationships using a sociogram, defining aims regarding relationships, e.g., building up new social contacts, and suggestions how to promote social well-being.
10. Redefinition of the relationship to the lost partner	Writing a farewell letter to the lost partner mentioning the future importance of the loss and how participants will continue their life without their partners.

Table 2

Demographics and sample characteristics at baseline for the intervention and the waiting control group

	Total	Intervention group	Wait-list control group
	<i>N</i> = 110	<i>n</i> = 61	<i>n</i> = 49
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Age (<i>M, SD</i>)	51.33 (14.17)	50.25 (13.32)	52.70 (15.22)
Gender			
Female	79 (72%)	46 (75%)	33 (67%)
Male	31 (28%)	15 (25%)	16 (33%)
Event			
Spousal bereavement	25 (23%)	12 (20%)	13 (26%)
Separation / divorce	85 (77%)	49 (80%)	36 (74%)
Current marital status			
Separated	33 (30%)	17 (28%)	16 (33%)
Divorced	27 (25%)	14 (23%)	13 (27%)
Single	22 (20%)	14 (23%)	08 (16%)
Married / cohabiting	04 (3%)	04 (6%)	-
Widowed	24 (22%)	12 (20%)	12 (24%)

Education			
Compulsory school	02 (2%)	01 (1%)	01 (2%)
Apprenticeship	20 (18%)	15 (25%)	05 (10%)
Secondary II	10 (9%)	03 (5%)	07 (15%)
Technical college	40 (37%)	20 (33%)	20 (42%)
University	37 (34%)	22 (36%)	15 (31%)
Nationality			
Swiss	80 (73%)	47 (77%)	33 (67%)
German speaking countries	24 (22%)	11 (18%)	13 (27%)
Other countries	06 (5%)	03 (5%)	03 (6%)
Years since event (<i>M, SD</i>)	02.20 (2.90)	02.10 (3.40)	02.32 (2.16)
Duration relationship (<i>M, SD</i>)	17.15 (13.83)	15.93 (12.51)	18.72 (15.36)
Persistent Complex	27 (24.5%)	16 (26.2%)	11 (22.4%)
Bereavement Disorder ^a			

Note: ^a Modified criteria: symptoms persistent for 6 instead of 12 month; criteria also applied to separated/divorced participants

Table 3

Demographics and sample characteristics at baseline of widowed and separated/divorced participants

	Widowed	Separated / Divorced			
	<i>n</i> = 25 <i>n</i> (%)	<i>n</i> = 85 <i>n</i> (%)	Test statistic	<i>p</i>	<i>ES^c</i>
Age (<i>M</i> , <i>SD</i>)	63.40 (7.77)	47.74 (13.68)	<i>t</i> (71) = -7.27	.001	1.24
Gender					
Female	20 (80%)	59 (69%)	$\chi^2(1) = 1.07$	.301	0.10
Male	05 (20%)	26 (31%)			
Condition					
Intervention group	12 (48%)	49 (58%)	$\chi^2(1) = 0.73$	.394	0.08
Waiting control group	13 (52%)	36 (42%)			
Current marital status					
Separated	-	33 (39%)	$\chi^2(4) = 84.75$	.000	0.88
Divorced	02 (8%)	25 (29%)			
Single	-	22 (26%)			
Married / Cohabiting	01 (4%)	03 (4%)			
Widowed	22 (88%)	02 (2%)			
Education					
Compulsory school	-	02 (2%)	$\chi^2(4) = 2.63$	.622	.155

Apprenticeship	06 (24%)	14 (17%)			
Secondary II	02 (8%)	08 (10%)			
Technical college	11 (44%)	29 (34%)			
University	06 (24%)	31 (37%)			
Nationality					
Swiss	15 (60%)	65 (76%)	$\chi^2(2) = 3.83$	.147	0.19
German speaking	09 (36%)	15 (18%)			
countries					
Other countries	01 (4%)	05 (6%)			
Years since event (<i>M, SD</i>)	02.09 (1.73)	02.23 (3.17)	$U = 950.00$	.420	0.15
Duration relationship (<i>M, SD</i>)	29.03 (14.33)	13.57 (11.54)	$U = 418.50$	.000	0.96
Persistent Complex Bereavement Disorder ^{a,b}	2 (8.0%)	25 (29.4%)	$\chi^2(1) = 4.78$	.029	-0.21
Grief ^b (<i>M, SD</i>)	3.51 (0.60)	3.38 (0.73)	$t(105) = -0.83$	.377	-0.19
Depression ^b (<i>M, SD</i>)	0.95 (0.39)	0.96 (0.50)	$t(105) = 0.12$	.876	0.02
Psychopathology ^b (<i>M, SD</i>)	0.82 (0.36)	0.88 (0.56)	$t(63.4) = 0.60$	.548	0.13
Embitterment ^b	1.24 (0.72)	1.69 (0.91)	$t(105) = 2.28$	.011	0.55

(<i>M</i> , <i>SD</i>)					
Loneliness ^b	2.61 (0.78)	2.92 (0.86)	$t(105) = 1.62$	.090	0.40
(<i>M</i> , <i>SD</i>)					
Life satisfaction ^b	4.80 (0.92)	4.28 (1.13)	$t(105) = -2.30$	.014	-0.51
(<i>M</i> , <i>SD</i>)					

Note: ^a Modified criteria: symptoms persistent for 6 instead of 12 month; criteria also applied to separated/divorced participants. ^b Bootstrap 1000 samples. ^c ES = Cohen's *d* for continuous data or Cramer's *V* for ordinal data.

Table 4
Efficacy of LIVIA: Intervention versus wait-list control group and stability of the effects

Domain	Pre-treatment		Post-treatment (observed)		Post-treatment (estimated)		Follow-up (observed)		Follow-up (estimated)		Time x treatment	Pre-post Within group ^a	Between group ^a	Post-follow-up ^b
	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SE</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SE</i>)	<i>n</i>	θ , <i>t(df)</i> , <i>p</i> , [95% CI]	<i>d</i> _{Cohen} , [95% CI]	<i>d</i> _{ppc2 sensu Morris}	<i>d</i> _{Cohen} , [95% CI]
Grief														
Treatment	3.49 (0.73)	60	2.79 (0.86)	51	2.79 (0.12)	61	2.67 (0.94)	49	2.68 (0.13)	51	$\theta = -.57$, $t(95.11) = -4.08$, $p < .001$, [-.85, -.29]	-0.88, [0.35, 1.40]	0.81	-0.12 [-0.43, 0.67]
Control	3.33 (0.66)	48	3.22 (0.86)	47	3.20 (0.13)	49						-0.17, [-0.40, 0.74]		
Depression														
Treatment	1.04 (0.53)	61	0.62 (0.50)	51	0.61 (0.07)	61	0.54 (0.48)	49	0.54 (0.07)	51	$\theta = -.29$, $t(95.90) = -4.03$, $p < .001$, [-.44, -.15]	-0.84, [0.31, 1.36]	0.59	-0.16 [-0.39, 0.71]
Control	0.92 (0.43)	49	0.77 (0.50)	47	0.78 (0.07)	49						-0.30, [-0.26, 0.86]		
Psychopathology														
Treatment	0.95 (0.64)	61	0.60 (0.52)	51	0.60 (0.07)	61	0.78 (0.73)	49	0.80 (0.10)	51	$\theta = -.22$, $t(98.17) = -2.61$, $p = .011$, [-.38, -.05]	-0.60, [0.09, 1.11]	0.39	-0.31 [-0.87, 0.24]
Control	0.86 (0.51)	49	0.72 (0.44)	47	0.73 (0.07)	49						-0.25, [-0.31, 0.81]		
Embitterment														
Treatment	1.58 (0.85)	61	1.19 (0.90)	51	1.18 (0.13)	61	1.18 (0.91)	49	1.17 (0.13)	51	$\theta = -.34$, $t(96.69) = -2.83$, $p = .006$, [-.57, -.10]	-0.45, [-0.06, 0.95]	0.37	-0.02 [-0.53, 0.57]
Control	1.66 (0.95)	49	1.57 (1.01)	47	1.60 (0.14)	49						-0.06, [-0.50, 0.62]		
Loneliness														
Treatment	2.89	61	2.43	51	2.39	61	2.42	49	2.41	51	$\theta = -.33$, $t(98.52) = -2.27$,	-0.63,	0.37	-0.02

Control	(0.77)		(0.82)		(0.12)		(0.89)		(0.13)	$p = .025, [-.61, -.42]$	[0.11, 1.14]		[-0.53, 0.57]
	2.84	49	2.63	47	2.66	49					-0.20,		
	(0.95)		(0.88)		(0.12)						[-0.37, 0.76]		
Life satisfaction													
Treatment	4.38	59	4.59	51	4.56	61	4.73	49	4.72	51	$\theta = .49,$	-0.16,	-0.41
	(1.14)		(1.16)		(0.16)		(1.17)		(0.17)		$t(95.16) = 2.74,$	[-0.66, 0.35]	-0.12
Control	4.43	49	4.20	47	4.15	49					$p = .007, [.14, .85]$	-0.24,	[-0.66, 0.44]
	(1.10)		(1.25)		(0.18)							[-0.32, 0.80]	

Note. ^a estimated values. ^b only for participants of the intervention group with a post measure ($n = 51$)

Moderator analyses for participants in the intervention group: Efficacy for divorced and bereaved participants and for different levels of grief at baseline

		Pre-treatment		Post-treatment (observed)		Post-treatment (estimated)		Pre-post Within group ^a	
Measure		<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SE)</i>	<i>n</i>	<i>d_{Cohen}</i> [95% CI]	
Grief	Divorced	3.48 (0.74)	48	2.73 (0.86)	41	2.73 (0.13)	49	0.94 [0.34, 1.53]	
	Widowed	3.52 (0.73)	12	3.02 (0.84)	10	3.03 (0.27)	12	0.62 [-0.54, 1.78]	
Depression	Divorced	1.06 (0.55)	49	0.63 (0.51)	41	0.62 (0.08)	49	0.83 [0.25, 1.41]	
	Widowed	0.94 (0.46)	12	0.56 (0.46)	10	0.57 (0.15)	12	0.80 [-0.37, 1.98]	
Psychopathology	Divorced	0.99 (0.69)	49	0.61 (0.50)	41	0.61 (0.08)	49	0.66 [0.09, 1.24]	
	Widowed	0.78 (0.28)	12	0.58 (0.60)	10	0.58 (0.16)	12	0.43 [-0.72, 1.57]	
Embitterment	Divorced	1.70 (0.87)	49	1.31 (0.90)	41	1.30 (0.14)	49	0.45 [-0.12, 1.02]	
	Widowed	1.06 (0.53)	12	0.68 (0.71)	10	0.71 (0.27)	12	0.56 [-0.56, 1.71]	
Loneliness	Divorced	2.95 (0.78)	49	2.48 (0.85)	41	2.44 (0.13)	49	0.63 [0.05, 1.20]	
	Widowed	2.63 (0.66)	12	2.23 (0.71)	10	2.18 (0.26)	12	0.67 [-0.49, 1.83]	
Life satisfaction	Divorced	4.29 (1.15)	47	4.54 (1.22)	41	4.54 (0.19)	49	-0.21 [-0.78, 0.36]	
	Widowed	4.73 (1.06)	12	4.80 (0.94)	10	4.61 (0.38)	12	0.13 [-1.00, 1.26]	

Grief	Low	2.60 (0.42)	17	2.15 (0.69)	15	1.94 (0.15)	17	1.16 [0.13, 2.18]
	Medium	3.41 (0.19)	20	2.67 (0.57)	16	2.69 (0.10)	20	1.70 [0.67, 2.72]
	High	4.21 (0.35)	23	3.31 (0.80)	19	3.45 (0.14)	23	1.23 [0.34, 2.12]
Depression	Low	0.73 (0.40)	17	0.39 (0.28)	15	0.38 (0.11)	17	1.01 [-0.00, 2.02]
	Medium	0.98 (0.41)	20	0.57 (0.42)	16	0.57 (0.07)	20	0.99 [0.06, 1.92]
	High	1.31 (0.59)	23	0.78 (0.59)	19	0.76 (0.10)	23	0.93 [0.07, 1.79]
Psychopathology	Low	0.62 (0.37)	17	0.42 (0.24)	15	0.40 (0.11)	17	0.71 [-0.27, 1.69]
	Medium	0.92 (0.49)	20	0.51 (0.30)	16	0.56 (0.07)	20	0.89 [-0.03, 1.81]
	High	1.14 (0.74)	23	0.76 (0.69)	19	0.73 (0.10)	23	0.57 [-0.26, 1.41]
Embitterment	Low	1.24 (0.78)	17	0.83 (0.85)	15	0.87 (0.20)	17	0.43 [-0.53, 1.39]
	Medium	1.53 (0.72)	20	1.10 (0.61)	16	1.12 (0.12)	20	0.61 [-0.28, 1.51]
	High	1.82 (0.92)	23	1.41 (0.95)	19	1.36 (0.18)	23	0.49 [-0.34, 1.32]
Loneliness	Low	2.64 (0.84)	17	2.31 (0.73)	15	2.29 (0.19)	17	0.45 [-0.52, 1.41]
	Medium	2.68 (0.58)	20	2.24 (0.78)	16	2.34 (0.12)	20	0.50 [-0.40, 1.39]
	High	3.19 (0.72)	23	2.56 (0.78)	19	2.39 (0.17)	23	1.07 [0.19, 1.94]
Life satisfaction	Low	4.75 (1.02)	17	5.13 (0.94)	15	5.01 (0.27)	17	-0.27 [-1.22, 0.69]
	Medium	4.40 (1.14)	20	4.60 (0.96)	16	4.61 (0.16)	20	-0.20 [-1.08, 0.68]
	High	4.07 (1.19)	22	4.20 (1.37)	19	4.20 (0.24)	23	-0.10 [-0.94, 0.74]

Note: ^a estimated values.